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Measurement of spatial gain profiles in multiple-pulse driven Ne-like Ge lasers

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Abstract - We present the first direct spatial measurement of the two dimensional gain profiles for a Ne-like ion using a slab target illuminated by the multiple pulse technique. To understand the spatial dependence of the gain in Ne-like Ge on the 19.6 nm laser line for plasmas driven by a series of 100 ps pulse 400 ps apart we did a series of Nova experiments backlighting short Ge amplifiers. Two-dimensional, high-resolution, spatial images of the 19.6 nm laser emission from the output aperture of the amplifiers was measured to determine the spatial position of the gain. The amplifier lengths were chosen to be short enough to avoid significant refraction of the beam. In previous imaging experiments which measured the near field output of the Ge laser, the position of the laser output was dominated by refraction effects. To assure good temporal overlap, we used the traveling wave geometry to illuminate both the amplifier and backlighter. The amplifier design included a wire fiducial which provided an absolute spatial reference and avoided the usual difficulty of determining the location of the target surface. We compare the measured gain with simulations done using LASNEX, which calculates the hydrodynamic evolution of the plasma, and XRASER, which uses the temperatures and densities from LASNEX to do the gain and kinetics calculations.

Biography - Dr. Nilsen has a B. S. in Engineering Physics from Cornell University and a Ph. D. in Physics from the California Institute of Technology where he did a thesis on Phase Conjugation via Four-Wave Mixing in a Resonant Medium under the supervision of Dr. Amnon Yariv. Dr. Nilsen was a Hertz Fellow at the California Institute of Technology and is a member of the OSA and APS. At Lawrence Livermore National Laboratory, Dr. Nilsen has spent the last decade designing X-ray lasers and currently holds three X-ray laser patents. His work has resulted in the demonstration of the world's shortest wavelength, highest energy experimentally demonstrated laser.

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